PORTLAND SERVICE CENTER
Resource Standards & Technology
Portland, Oregon

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U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

TECHNICAL NOTES

May 27, 1966

WATER CATCHMENT DEVELOPMENTS

As water is becoming a prime concern for proper land management and maximum production of livestock, big game and upland game, it is necessary to develop methods for harvesting rainfall in areas where water is not economically available by any other means (wells, springs, reservoirs, or pumping).

These notes are only a general review showing cost, some methodology and thoughts on water catchments. A future manual release will cover all specifics and guidelines.

HOT CREEK GUZZLER

In 1961, water was needed for livestock and wildlife in a previously dry area. Lava formation, pumice soil and lack of drainage ruled out the possibility of a well or reservoir. With no chance of economically developing water any other way, a cattle guzzler was constructed.

A site was selected taking into consideration proper distribution of livestock, economics of site preparation and slope. Due to the terrain, the maximum number of acres serviced by this guzzler will be about 1800 acres. In general, under good range management, a guzzler should service from 1 to 1.5 miles from the source or approximately 4300 acres.

Figure 1 shows general site location. Figures 2 and 3 on preparation of apron with figures 4 through 6 showing outlet and storage facilities. Due to the high hunting density, it was necessary to protect the storage tanks by covering them with soil. Figure 7 does not show the fence that has been constructed to protect the apron from damage by animals.

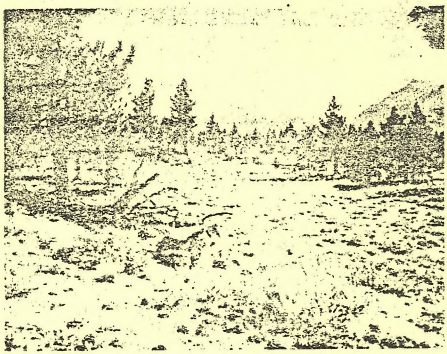

Figure 1 - Site location, North of Bishop, Mono County, California - Bakersfield District

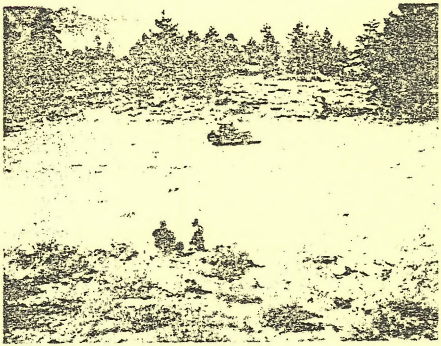

Figure 2 - Foundation preparation for asphalt apron

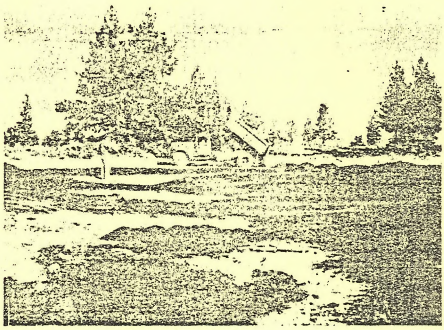

Figure 3 - Spreading of premix asphalt

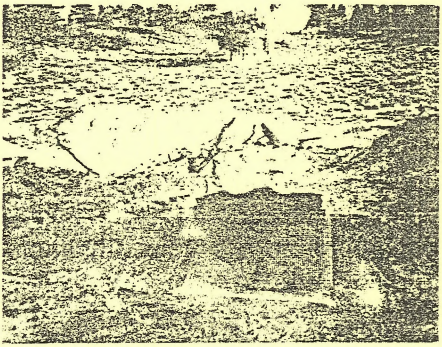

Figure 4 - Outlet to buried storage tanks and emergency overflow outlet

Figure 5 - Outlet pipe, overflow pipe and storage tanks installation

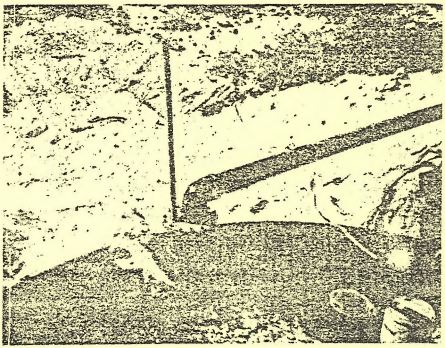

Figure 6 - Air vent and intake installation

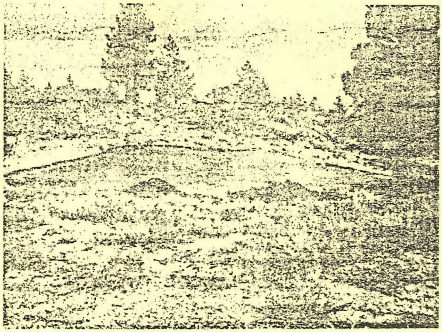

Figure 7 - Completed apron and excess asphalt for repairs

The asphalt apron was formed to fit the area and is approximately 100 feet square. Grazing was limited by available forage (117 AUM's); this factor and precipitation determined the storage and apron size. Average precipitation is from 12 to 15 inches. Seventy percent is in the form of snow and thirty percent in the summer from convectional storms. The asphalt was spread on approximately 3 inches thick and compacted to 1 inch. Slope varied from 3 to 5 percent. Ample water has been available for upland game and big game throughout the dry season.

No maintenance on the project has been needed by April 1966 but ant damage and some creeping has occurred within the apron area and will probably need maintaining this year.

Table 1. Itemized Cost List

Items	Cost
Labor to prepare apron foundation, construct apron and install tank	$1,400.00
Transport tanks to site (250 miles approx.)	195.00
Transport asphalt to site (45 miles approx.)	512.17
Asphalt for apron (108 cubic yards)	594.00
Four storage tanks with tops and coating (4200 gals. each)	1,670.00
Plastic pipe, steel pipes, trough and misc. bolts, etc.	107.05
Weighing asphalt	13.00
Travel and per diem for permanent personnel	39.27
Communications	2.35
Fencing; materials, labor, transportation	100.00
	$4,632.84

MAHOGANY RAINFALL CATCHMENT

In 1964, after adjudication of an individual allotment, a water source was needed in a portion of the allotment that was previously used only when snow was available. The area is rough basalt country and even with numerous springs in the lower portions of the allotment, proper distribution of livestock was not possible. Precipitation averages about 10 inches in the form of both snow and rain and subject to high intensity summer storms. The decision was made to put the rainfall catchment near the top of allotment so stored water could be piped to different areas.

At the selected site (fig. 1) an area of 100' x 120' was cleared with a bulldozer and smoothed with a motorgrader. The cleared area was treated with a soil sterilant to prevent plant growth. A tack coat of hot road oil was sprayed over the entire area to prepare it for the asphalt mix. Asphalt was spread 4 inches deep then rolled for compaction and later sprayed with hot road oil and then dusted with sand and small gravel and rerolled in to give a firm smooth surface.

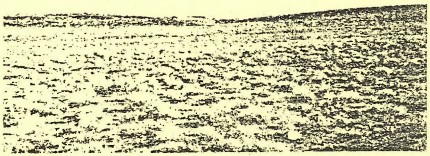

Figure 1 - General location of catchment

An 8 inch berm of dirt was constructed around the top and sides of the apron and sprayed with road oil. A sloping berm varying from 8 inches to 40 inches was placed across the lower end of the apron (fig. 2). The outlet (fig. 2) was constructed of 1/4" mild steel, 4 feet deep and 3 feet high, with a 6 inch washout pipe and a 6 inch outlet pipe. The inlet side has a removable screen of heavy steel for stopping any large objects or animals that might plug the water distribution system.

A 68,000 gallon steel storage tank was installed 300 feet from the catchment site. The tank was installed by excavating to a depth of 7 feet by using a dozer tractor and back-hoe. Due to the remote area, the storage tank was purchased in 16 segments and welded together at the site. The bottom half of the tank was (8 segments each, 7½ feet high and curved to a 15 foot radius) formed and welded together and dirt filled in around the outside (fig. 3).

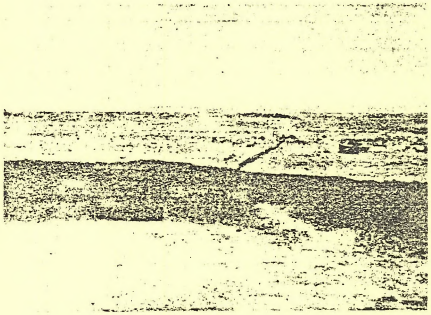

Figure 2 - Outlet box and bottom berm

A 4 inch steel reinforced bottom of concrete (12 yards) was then poured. The top half of the tank was then installed making a circular tank 15 feet deep and 30 feet in diameter; the entire tank, with the exception of the top 4 feet, is either underground or surrounded by dirt (fig. 4).

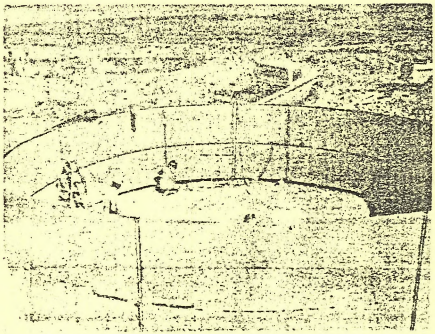

Figure 3 - Lower segment of storage tank

All outside underground parts of the tank were coated with heavy roofing tar. All welded joints were painted with zinc chromate to prevent rusting. The outlet and overflow pipes are 6 inch coated culvert pipe. Depth markers were painted inside the tank and a steel ladder installed. The outlet pipe is 1½ inches in diameter, located 6 inches from the bottom of the tank. A valve at the bottom of the tank has a 12 foot extension handle for easy shut off or flushing. A 1/4 inch vent cock was placed in the main discharge line to insure proper cold weather draining.

Figure 4 - Outlet pipe from apron and storage tank

At this time only two stock watering troughs equipped with regulating and shutoff valves were installed; one trough being 300 feet from the storage tanks and the other 2440 feet away. The pipelines are 1½ inch plastic (70 lbs. pressure rated) and are buried a minimum of 2 feet due to winter temperatures of minus 30 degrees.

A 4½ foot, 5-barbed wire, double-stay fence surrounds the entire catchment and storage area (fig. 5).

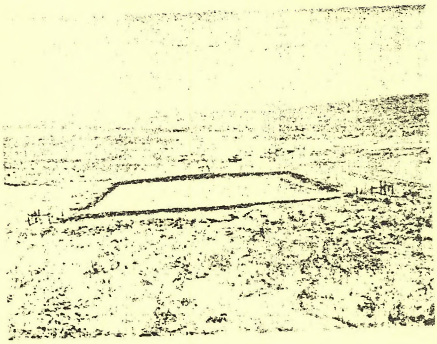

Figure 5 - Completed project with exception of trough

A 12 inch deep ditch around the perimeter of the catchment area will aid in preventing mud and silt from washing onto the apron during snow melt and high intensity storms. All disturbed areas were seeded with wheatgrasses to prevent erosion and supply cover for upland game.

MAHOGANY RAINFALL CATCHMENT EXPENDITURES

Materials

2 ea.	34,000 gallon storage tanks	$ 1,524.00
175.5 tons	asphalt mix	1,228.00
112 hours	hauling asphalt to site (from Cedarville, California)	1,680.00
19 ea.	20' coated 6" culvert and couplings	449.20
3 ea.	6" coated 90° elbows	43.62
20 ea.	plastic couplings	3.60
2 ea.	valves	31.80
2 ea.	floats	63.60
-	couplings and nipples	12.74
600 ft.	reinforcing rod	43.50
12-1/2 yards	concrete mix	437.50
13 sacks	cement	18.20
6 yards	gravel	9.00
1950 ft.	1-1/2" plastic pipe	434.50
2 ea.	495-gallon rectangular troughs	145.00
80 ea.	5-1/2' steel posts	69.60
46 ea.	6-1/2' treated wood posts	75.90
7 rolls	barbed wire	50.38
5 lbs.	nails	.50
200 ea.	wire stays	14.00
100 lbs.	Greenar wheatgrass seed	30.50
	Miscellaneous items: oxygen, welding rod, fittings, etc.	271.09
	TOTAL	$6,636.23
Per diem		1,227.00
Salaries	Temporaries)	4,206.88
	Permanent) (142 man days)	473.26
Travel (Mileage)		1,659.20
Phone calls		3.30
Photographic expense		35.01
	GRAND TOTAL	$14,240.88

Started: July 8, 1965
Completed: October 14, 1965

CONCLUSIONS

Asphalt is one of the most economical materials available (.54 to $1.08 per square yard of effective surface -- varies due to size of berm) but due to maintenance, areas of inaccessibility, contamination by asphalt oxidation and long haulage from a source, it appears that certain metal, rubber and synthetic materials will be more desirable and economical over a long term period.

Before a decision is made to install a water harvester, a thorough analysis of the facts - location, precipitation and intensity, topography, soils, use, distribution and economics must be made.

APPLICABLE REFERENCES

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